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Examiners' Report January 2008

GCE

GCE Biology (8040/9040)
GCE Biology (Human) (8042/9042)
International Supplement

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Please note that this document is an International Supplement to the GCE Biology / Biology (Human) Examiners' Reports (8040/9040/9040/9042) and provides Examiners' Reports for Unit 3 (W1), 5 and 6, which are only available to International Centres.

6103/02 Unit 3 W1 Written Alternative Examiners' Report

Maximum mark..... 32

Mean mark 16.0

Standard deviation 5.1

General comments

A very wide range of marks appeared in this January's paper. Many candidates achieved high scores on Question 1 and a greater number on Question 2 than in the past. With regard to Question 2, some candidates were well prepared in terms of the basic ideas concerning experimental design, constructing tables and graphs relating to this design, and suggesting limitations and further work relevant to this investigation. A minority were not well informed at all and it was not unusual to find very low marks on this question.

Question 1

Part (a) was generally answered well, with a clearly designed table and correctly calculated mean cushion temperatures. Errors were unusual, with many candidates obtaining maximum marks. Omissions included the time reference and units. Most calculated mean cushion temperatures to an appropriate level (one or two decimal places) and limited units to headings only. Part (b) answers often carried at least one error. Nevertheless most plotted line graphs for both air and cushion temperatures, though many just plotted cushion temperature data. Plotting errors were not infrequent and candidates are advised in the future to check plots for accuracy and axes for correct labels.

Parts (c), (d) and (e) showed variable responses. In (c), candidates often scored either no marks or the maximum of two. Many just re-described the data, rather than reporting that the air temperature was always above the cushion temperature and that both temperatures increased early in the day and decreased in the afternoon. Very few made any attempt to illustrate differences by comparing the data through manipulation of figures. Most candidates recognised the term 'anomalous' in (d) and a large minority identified anomalous data at either 1200 or 1400 hours. These were significant improvements in comparison with the June 2007 paper. However, only a small number could explain the reason why. In (e), marking points 1 and 3 were frequently awarded, though there was much confusion about the advantage gained through the morphological adaptation demonstrated by the cushion plant. Frequently, candidates thought that surface area increased thereby providing more opportunity for photosynthesis. Their explanations were less secure than in the June paper.

Question 2

As outlined in **General comments**, this question resulted in higher overall scores than in the past. Many scripts showed evidence that candidates knew the correct techniques and understood how to present data. They applied the principles of sound experimental design to the current question. A few, however, were not well prepared. Nevertheless most points on the mark scheme were seen. It was not unusual to award maximum marks in (a). In this part, as always on this paper, candidates were rewarded for detail and well trained individuals scored highly. These candidates held the basic design securely and embellished it with detail. Major omissions were marking points 1 – 4 about the preparation of inoculum.

Examiners do not award marks for vague comments and in this respect Centres may find the following comments helpful. In some Centres, there is a need for improvement in basic design skills. For example, candidates are advised to use *volume* instead of amount, provide a suitable range for the independent variable and omit qualifications to quantity such as *approximately, around* and *about*.

There were 3 marks for (b) and, in contrast to the summer, many scored maximum marks. Raw data and the type of graph were the most common omissions. Candidates are advised to design a table and to draw their proposed graph. Attempting to describe these features rarely results in a maximum score.

As in the past, (c) presented many candidates with the most significant challenge on this paper. Marks were most frequently obtained for further work and Examiners saw all the points on the mark scheme, though most popular were marking points 7, 8, 9 and 11. Many responses on limitations were not relevant to this investigation and those that were often included corrections to the plan. This is a common feature, especially for low scoring candidates. If these are put as bullet points in the plan, even as retrospective ideas, they will improve marks in (a).

6105 Unit 5B Examiners' Report

Maximum mark..... 70

Mean mark 36.2

Standard deviation 13.1

General comments

The Examiners were pleased to see some good answers in all sections of this paper. There were very few occasions where no answer had been attempted.

Question 1

In (a), almost all answers were correct. In (b), there were some very good answers that showed clear understanding of the process of sympatric speciation. Even where candidates recognised that a sympatric mechanism was operating, only the better candidates included details to explain how the gene flow between sub-groups would be restricted. Many candidates confused allopatric speciation and sympatric speciation, or attempted to suggest how the population would be separated by a geographic barrier. In (c), most candidates gained at least two out the three marks. References to resistance to the insecticides, specificity of the predator and resurgence were the most frequent answers. A number of candidates referred to insects becoming immune rather than resistant to the insecticide. Another common error was to make a vague reference to pollution rather than specifically contamination of the crop by insecticides.

Question 2

In (a), most candidates gave acceptable answers. In (b), there were some very good answers that gained full credit. The most common confusion was the role of ligase with many candidates stating that it was catalysing the formation of bonds between the complementary bases. Hydrogen bonding between the bases was given rarely. Part (c) was answered well by the better candidates only. There was a lot of confused and vague reference to use of X-rays and radioactive probes. Candidates who referred to the idea of antibiotic did not always include the idea of a marker gene.

Question 3

The definitions with reference to ABO blood grouping in (a) were generally disappointing. In (a)(i), codominance was often stated to be where an intermediate phenotype is seen, rather than the idea of both alleles being expressed. In (a)(ii), many candidates stated that more than one allele was involved rather than more than two. The use of inaccurate terminology with reference to alleles, genes and loci penalised a number of candidates. Part (b)(i) was usually answered correctly. Answers to (b)(ii) were usually correct. The most common omissions were not giving the parental genotypes, or not identifying the genotype that would give group O blood.

Question 4

Most of the calculations were correct for (a)(i). Answers to two decimal places were not accepted, as this is not consistent with the data in the table. The answers in (a)(ii) usually showed reasonable understanding. The most common errors were referring to the losses in the producers and references to egestion by the primary consumers. The answers to (b) usually gained full credit. In (c), most candidates were able to gain some of the marks. Full credit was given on many papers. At this level, it is expected that detailed descriptions of damage by acid rain would be given, rather than vague reference to killing leaves or burning roots. Some candidates linked the reduction in photosynthesis to changes in pH within the cells, rather than the loss of leaves.

Question 5

In (a)(i), nucleotide or mononucleotide was usually correct. In (a)(ii), the most common error was to refer vaguely to sugar, a base or phosphoric acid. More specific answers are expected when referring to DNA. Answers to all of the sections in (b) were usually acceptable. In (b)(ii), a number of candidates stated that one strand of the original DNA would be used as a template. Very few candidates gained the mark in (b)(iii) for stating that DNA polymerase is an enzyme. In (c), there were many general accounts that repeated the ideas given in the stem of the question about the differences in the daughter cells, rather than giving details of the events during the divisions. Candidates who concentrated on these details usually scored well.

Question 6

In (a)(i), the drawings usually gained some credit. The most common errors included using a double line to show membranes, showing vesicles passing across the synaptic cleft and labelling the pre-synaptic and post-synaptic membranes at inappropriate points away from the cleft. Answers to (a)(ii) usually scored well. In (b), most candidates gained 3 marks for the initial statements about the absorption of nicotine by diffusion into the blood at the alveoli. Although there were some detailed accounts of nicotine as a mimic of acetylcholine at the synapse, many candidates did not show any understanding of this effect. Common errors included references to nicotine in the synaptic vesicles or nicotine preventing the formation of acetylcholine.

Question 7

The answers to (a) were usually correct. In (b), most candidates gained full credit for reference to the molecule becoming more reactive and not being able to leave the cell. The idea of lowering the activation energy was seen very rarely. The most common error was to refer to the molecule having more energy or being more active. In (c), most candidates gained full credit. Pyruvate was missed by a number of candidates. In (d)(i), many candidates gained marks for the description of the inhibitor binding to the enzyme at an allosteric site. A number of candidates referred to hexokinase as the substrate. Very few candidates explained that an increase in concentration means that there would be more molecules available. Most candidates gave the idea that the reaction would slow down in (d)(ii). Only the better candidates were able to explain how this would lead to a slowing of the diffusion of glucose into the cell as the concentration gradient approached equilibrium. The idea that, as this happens, more would have to diffuse in to increase the glucose concentration in the cell was not understood by most candidates. Some candidates suggested that the gradient would be reversed and that glucose would leave the cell.

6106/02 Unit 6 W2 Written Alternative Examiners' Report

Maximum mark..... 38

Mean mark 15.8

Standard deviation 6.0

General comments

It is worthwhile reiterating comments made in previous reports. This paper is an alternative assessment of practical investigation skills required for Unit 6. As such, wherever possible, the Examiners apply the same standards and criteria as those for the Individual Investigation; consequently, those candidates who have experience of real-life investigations will be at an advantage. There was, once again, in this paper evidence that candidates who rely heavily on applying previous mark schemes, rather than thinking more carefully about the actual question, are more likely to make basic errors which limit their marks.

Question 1

Whilst basic tabulation was almost always correct in (a), many responses were very limited. Only a very small minority were able to convert cm^2 into m^2 and many did not even attempt to do so. Simply adding the barnacle counts was a common error as was the omission of units from the heading of dogwhelk numbers. In (b), scatter diagrams without lines were accepted and there were a significant number of well-chosen lines of 'best fit'. Some candidates continue to limit their marks with lack of attention to details, such as accurate axis labelling with units, or plotting points to a reasonable degree of accuracy matched to their chosen scale. A large majority of candidates correctly calculated the coefficient in (c). The Examiners were looking for precise interpretations of statistical tests in (d). There was a wide variation in responses to this requirement. To demonstrate their understanding, it is expected that candidates will quote 5% confidence values correctly, rather than just repeat p = 0.05 from the rubric. Similarly, it is expected that candidates would explain that this was a 'significant correlation' at this confidence limit. A number of candidates made strong assertions about a causal relationship such as 'proves that barnacles are the principal food source of dogwhelks', which could not be accepted.

Question 2

In (a), there were many good attempts to plan a basic investigation matched to this hypothesis. Although simply planting *Hieracium* with *Festuca* seeds would provide useful data, those suggesting more accurate methods of preparing pure extracts from roots gained more credit. Similarly many candidates simply suggested 'soil' rather than a more easily controlled growth medium. It would be helpful to remind candidates that attempting to control variables, such as light and temperature, by placing them 'in the same laboratory' or 'close to the same window' is much too inaccurate at this level. This section is also used to award marks for quality of written communication. Whilst the Examiners take into account that plans are written quickly under time pressures, it would be helpful to advise candidates to use complete sentences and avoid ungrammatical lists or phrases.

Most candidates were able to compile a suitable table in (b), but simply recording % germination, or means, does not meet the requirement for tabulation of raw data. The suggested graphical presentation and statistical analysis were often clearly and concisely explained. The Examiners were pleased to see that many candidates were able to select further work in (c) that was clearly relevant to the hypothesis under test and, although suggestions of limitations were sometimes weak attempts to correct a poorly planned method, there was a range of good evaluations.

6106/03 Unit 6 Synoptic Examiners' Report

Maximum mark..... 38

Mean mark 16.9

Standard deviation 6.4

General comments

Synoptic questions are intended to give candidates opportunities to apply their knowledge and understanding to new and possibly unfamiliar contexts. The questions also require the integration of knowledge from different units of the specification content. It follows, therefore, that for success with synoptic questions candidates require both a sound recall of factual knowledge, and an ability to apply their knowledge. As an illustration, Question 1 required the application of knowledge and understanding of meiosis (Unit 2), chromosome mutation, non-disjunction and polyploidy (Unit 5).

The answers to Question 1 were very variable and it was clear that many candidates found it difficult to apply their knowledge to this context. In general, Question 2 was answered more successfully. The standard of the essays was as variable as ever, from those with little or no relevant content, to those showing a detailed and accurate knowledge of the subject content. Although some of the essays were written in coherent, continuous prose, many were not and there was a tendency for candidates to write their essays in the form of short notes, bullet point lists, and tabulated information. These should not be included in the synoptic paper essay, where answers are expected to be written in continuous prose.

For a high mark in the synoptic essay, candidates are expected to include information from more than one of the specification units and to integrate knowledge from both the AS and A2 content. Previous subject reports have commented upon the poor recall of AS content, compared with more accurate recall of A2 content, by some candidates. This was again apparent, for example in Question 4B, where sometimes only sketchy details of the structure of a chloroplast were included.

Question 1

The answers to (a) were surprisingly variable, even for Infertile hybrid A, which suggests that a number of candidates found it difficult to interpret the information presented and to use their knowledge of meiosis and fertilisation to find the chromosome numbers of these two hybrids. There were some rather weak answers to (b)(i), where candidates did not appreciate the importance of homologous chromosomes needed for meiosis and gamete production. Some of the answers referred to the parents as different species, but did not attempt to explain why the hybrids are infertile. In (b)(ii), many candidates referred to the failure of chromosomes to separate, but indicated that this may happen during meiosis, rather than mitosis. The term 'non-disjunction' was used correctly by a number of candidates. There were some good answers to (b)(iii), in which candidates clearly appreciated that, if chromosomes double, meiosis is subsequently able to occur. In (c), there were many acceptable references to increased genetic variation and resistance to disease. In general, this part of the question was answered more successfully than (b).

Question 2

There were some good, detailed answers to (a), which included references to the attachment of carbon dioxide to haemoglobin, and to the formation of hydrogencarbonate ions. In a number of cases, candidates incorrectly named the compound formed by the attachment of carbon dioxide to haemoglobin as carboxyhaemoglobin. Some of the weaker answers referred to either the role of haemoglobin in the transport of carbon dioxide, or to the formation of hydrogencarbonate, but not both. There were many references to carbonic anhydrase, but candidates were not always sure which reaction is catalysed by this enzyme. Part (b)(i) was answered correctly by the majority of candidates, and credit was given for naming either the medulla, or the medulla oblongata. In (b)(ii), although many candidates correctly described the relationship between the concentration of carbon dioxide and the volume of air breathed, relatively few attempted to quantify this in any way. In questions of this type, candidates are given credit for qualifying their answer with reference to a manipulated, quantitative comment, rather than simply quoting figures directly from the table of data. There were some good comparisons in (b)(iii) in which many candidates gained two or three marks. Weaker candidates described the general trend and referred to the increase in both, but did not describe the differences between the human and the seal, noting that, for example, the value for the seal is lower than the value for the human at a carbon dioxide concentration of 8%. The answers to (c) were very variable. Some candidates gave correct, physiological explanations, but others either repeated information from the table, or stated that these differences are due to adaptation to diving, without any further explanation. In (c)(i), many candidates gained credit for references to haemoglobin or to the numbers of red blood cells and in (c)(ii) there were some good suggestions about the relative concentrations of myoglobin and its role in oxygen storage. Part (d) was answered correctly by many candidates with reference to the production of lactic acid, or lactate, by anaerobic respiration.

Question 3

This question was attempted by approximately 44% of candidates. Many of the answers included outlines of the structures of monosaccharides, disaccharides and polysaccharides, essentially repeating information from Unit 1 of the specification, but without attempting to put this into a broader context with references to monosaccharides as energy substrates and conversion of glucose to glycogen from Unit 4, or references to the synthesis of carbohydrates in photosynthesis, from Unit 5. The style of essays here was often particularly poor, with tabulated information and bullet point lists. It was also clear that a number of candidates were unsure of some of the basic factual knowledge, for example, the structure of glucose and the formation of a glycosidic bond.

Question 4B

This question was attempted by approximately 53% of candidates. There were some very good attempts with details of chloroplast structure and comprehensive descriptions of light-dependent and light-independent photophosphorylation, and carbon dioxide fixation. Occasionally, the AS knowledge was weak, with inaccurate descriptions of chloroplast structure, or simply an inadequately labelled diagram. Some of the weaker essays digressed into accounts of phytochrome and the detection of light. There were some excellent attempts in which candidates accurately described the structure of a chloroplast and related the structure to its functions of both trapping light energy and transducing this in the synthesis of carbohydrate.

Question 5H

Only approximately 3% of candidates attempted this question and good essays on this topic were correspondingly rare. Many of the attempts were of average or below average quality and usually included information from Unit 4 only. Details of temperature regulation, with references to the roles of the skin, thermoreceptors and the hypothalamus from Unit 2H, in addition to the details of homeostasis from Unit 4, were expected for a high mark.

APPENDIX A

UNIT GRADE BOUNDARIES AND UNIFORM MARKS

The raw mark obtained in each module is converted into a standardised mark on a uniform mark scale, and the uniform marks are then aggregated into a total for the subject. Details of the method of aggregation are given in Appendix A.

For AS examinations, the three unit tests each have a weighting of 33.3% with a maximum of 100 uniform marks.

For the A level, the six unit tests each have a weighting of 16.7% with a maximum of 100 uniform marks.

The table below shows the boundaries at which raw marks were converted into uniform marks in this examination. The A and E grade boundaries are determined by inspection of the quality of the candidates' work. The other grade boundaries are determined by dividing the range of marks between A and E. Marks within each grade are scaled appropriately within the equivalent range of uniform marks.

In Unit 3, the A and E boundaries are determined separately on the two components Paper 01 (T1) and Paper 03 (or Paper 02 (W1) and Paper 03 for International candidates only). These marks are then added together to find the A and E boundaries for Unit 3 as a whole, and the other grade boundaries for the Unit are then found as described above. Boundaries for the B, C and D grades for each component can be calculated in the same way, but please note that these are **not** simply added together to obtain the B, C and D boundaries for the unit as a whole.

In Unit 6, the A and E boundaries are determined separately on the components Paper 01 (T2), Paper 02 (W2) and Paper 03. These marks are then added together to find the A and E boundaries for Unit 6 as a whole, and the other grade boundaries for the Unit are then found as described above. Boundaries for the B, C and D grades for each component can be calculated in the same way, but please note that these are **not** simply added together to obtain the B, C and D boundaries for the unit as a whole.

Unit grade boundaries for January 2007 can be found on the next page.

Unit grade boundaries

Unit	Maximum mark	Grade				
		A	B	C	D	E
	Uniform marks 100	80	70	60	50	40
6101 Unit 1	*Raw marks* 60	44	39	34	30	26
6102 Unit 2B	60	44	40	36	32	28
6112 Unit 2H	60	45	41	37	33	29
6103 Unit 3	70	51	45	39	33	28
Paper 01 T1	*26*	*22*	*18*	*15*	*12*	*12*
Paper 03	*25*	*22*	*20*	*18*	*16*	*19*
6103 Unit 3 (International option)	70	47	42	37	33	29
Paper 02 W1 International only	*22*	*19*	*17*	*15*	*13*	*11*
Paper 03	*25*	*22*	*20*	*18*	*16*	*19*
6104 Unit 4 Option A	70	44	39	35	31	27
6104 Unit 4 Option B	70	48	43	38	33	29
6104 Unit 4 Option C	70	44	39	35	31	27
6105 Unit 5B	70	50	45	40	35	30
6106 Unit 6 (Option 1)	70					
Paper 01 T2						
Paper 03						
6106 Unit 6 (Option 2)	70	49	43	37	32	27
Paper 02 W2	*24*	*20*	*17*	*14*	*11*	*12*
Paper 03	*25*	*22*	*20*	*18*	*16*	*19*

APPENDIX B

The Uniform Mark System for AS and A level Unit Schemes

The result for each unit will be issued as a standardised mark on a uniform mark scale. AS subjects have a total of 300 uniform marks and A level subjects have a total of 600 uniform marks.

Tables 1 and 2 show the numbers of uniform marks required to gain each subject grade in AS and A level examinations. They also indicate the number of uniform marks in units with various weightings that will aggregate into the appropriate subject grade. These provide a guide to the level of performance in each unit.

The uniform marks shown for each unit do not necessarily represent the actual mark range used for marking. Grade boundaries are set at Awarding meetings on the basis of candidate performance on the actual mark range used. These boundaries are then converted to the uniform marks shown in the tables, with intermediate values calculated accordingly.

Table 1 – Advanced Subsidiary Subjects

Subject		Unit Weighting					
Grade	**UMS**	**20%**	**30%**	**$33\frac{1}{3}$%**	**40%**	**50%**	**60%**
Max mark	**300**	60	90	**100**	120	150	180
A	**240**	48	72	**80**	96	120	144
B	**210**	42	63	**70**	84	105	126
C	**180**	36	54	**60**	72	90	108
D	**150**	30	45	**50**	60	75	90
E	**120**	24	36	**40**	48	60	72

For example, a candidate for AS Biology or Biology (Human) must take three modules, all weighted at 33.3% of the subject.

	Uniform mark obtained	**Approximate level of performance**
Unit 1	65	C
Unit 2	73	B
Unit 3	80	A
Subject Total	**218**	**Subject Grade = B**

Table 2 – Advanced Level Subjects

Subject		Unit Weighting				
Grade	**UMS**	**15%**	**16^{2}_{3}%**	**20%**	**25%**	**30%**
Max mark	**600**	90	**100**	120	150	180
A	**480**	72	**80**	96	120	144
B	**420**	63	**70**	84	105	126
C	**360**	54	**60**	72	90	108
D	**300**	45	**50**	60	75	90
E	**240**	36	**40**	48	60	72

For example, a candidate for A level Biology or Biology (Human) must take six units, all weighted at 16.7%. The candidate in this example has four units in the bank.

	Uniform Mark Obtained	**Approximate level of performance**
Unit1	78	B
Unit 2	65	C
Unit 3	75	B
Unit 4	82	A
Unit 5	50	C
Unit 6	*	
	Partial Total in Bank = 350	

The candidate already has 350 uniform marks in the bank. If a Grade C is required in the subject, the candidate must obtain at least 10 UMS marks from Unit 6 or if a Grade B is required the candidate must obtain 70 UMS marks or more from Unit 6.

There is no rule requiring candidates to take units amounting to 30% of the examination at the time of cashing in, nor do candidates have to take all papers with synoptic assessment at the same time at their first cash in.

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